



# An Airfreight Forwarder's Aggregate Resource Planning under Uncertainty

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## ABSTRACT

Airfreight forwarders are third-party logistics service providers who plan, coordinate and manage client shipments. They acquire airfreight spaces from three major sources: carriers (airlines), partners and subcontractors, all of which are different in terms of cost, flexibility and service reliability. Booking spaces directly from carriers is done several months in advance and is the cheapest. Under most situations, carriers do not allow any changes once the booking contracts are signed. Acquiring spaces from partners would cost more, and the available amount is typically smaller. But partners usually allow forwarders to finalize the bookings as late as one month before shipping time. International freight forwarding is greatly affected by fluctuating economic conditions. When shipping time arrives, forwarders could find themselves in need of additional resources or having surplus resources. For the former, forwarders may subcontract shipping requests to other industry agents; subcontracting cost is the highest, and the service reliability is typically the lowest. For the latter, forwarders may sell surplus resources to other agents.

An important concern of forwarders is whether the mix of bookings is indeed viable when implemented to meet individual shipment requirements. In this research, we provide a two-phase framework for this airfreight planning problem. The first phase is performed several months in advance and the second phase is performed close to the action time. In each timed phase, using the demand forecast at that time, a multi-item newsvendor model first determines, in aggregates, the resource requirements from carriers, partners, and subcontractors. A heuristic is then used to disaggregate the resource requirements into specific bookings. A simulation model simulates whether the bookings are viable during shipping time.

**Keywords:** airfreight forwarder, resource planning, demand uncertainty, optimization-simulation framework

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